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Hyphen-sized creature found to be biggest germ

Naked eye able to see single-celled giant

By Natalie Angier
New York Times News Service

Flouting the scientific canon that all bacteria are microscopic, researchers have discovered a strain so huge that it can be seen with the naked eye.

The single-celled organism, plucked from the bowels of an Australian fish, is about the size of a hyphen in a newspaper, making it by far the largest bacterium ever detected.

In measuring more than one-fiftieth of an inch in length and possessing a volume a million times that of the common E. coli microbe, the newly discovered bacterium seems to defy laws of biology that limit how big a simple bacterial cell can grow.

So outsized is the creature that researchers may soon be able to use it to begin exploring the intimate details of bacterial innards, a task impossible with the tinier species of microbes.

"It's so huge that we could stick electrodes into it," said Esther R. Angert of Indiana University in Bloomington. "There's a world of cell physiology that could be done with this thing."

The researcher, who is finishing her doctorate in the laboratory of Dr. Norman Pace, performed the experiments that demonstrated the bacterial nature of the beast.

She showed that despite its extraordinary dimensions, the organism's genes bore all the earmarks of a bacterium. The report of the giant bacterium, called Epulopiscium fishelsoni, appears today in the British journal *Nature*.

"I think it's incredibly exciting and it's an extremely convincing paper," said Dr. James R. Lupski of Baylor College of Medicine in Houston, who has long studied bacterial genetics. "The old way of defining a bacterium was to look under a m

See **BACTERIA**, 15A, Col.

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BACTERIA, from 1A

croscope, see what size it was and whether it stained one way or another. Now we're redefining life forms based on what kind of DNA they have."

Commanding though the bacterium is, it may not be the world's largest.

Realizing that bacteria have the ability to grow beyond boundaries previously set for them, scientists may well find other examples of single-celled beings with macroscopic aspirations.

"This type of study points to how little we know about microbial diversity," Ms. Angert said. "Here's this huge organism that seems to be a significant part of a fish's intestines, and it's just recently been discovered. Who can say what else is out there waiting to be found?"

Scientists have long believed that bacteria, as so-called prokaryotes that lack the internal equipment and cellular organization for swift movement of nutrients and oxygen inside them, must rely on slow diffusion to wrest what they need from their surroundings. So they must remain very tiny to allow essential molecules to drift from one part of the cell to another.

By comparison, the cells of higher organisms, such as yeast, algae, insects and humans, are eukaryotes and have small internal structures to ferry molecules about.

Pulverizing the genetic material from the bacteria, the researchers multiplied the DNA into millions of copies through the use of a technique called polymerase chain reaction.

They next compared the genes with those from many other known prokaryotes and eukaryotes and demonstrated that E. fishelsoni is a true bacterium.

Indeed, when the organism was discovered in 1985 by Israeli researchers who found it in the intestinal tract of common brown surgeonfish living in the Red Sea, they thought it must be an alga, protozoan or other eukaryote.

More recently, Kendall D. Clements of James Cook University in Queensland, Australia, found the same creatures in surgeonfish caught around the Great Barrier Reef of Australia.